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The Correlation of Central Obesity with Incident of High Cholesterol on Menopausal Woman in Indonesia (Analysis Secondary Data IFLS 2007 and 2014)

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ABSTRACT

Cholesterol is one component in forming fat. Cholesterol levels are said to be high if more than 240 mg/dl. Based on the 2013 Riskesdas data, most high cholesterol patients were women at 39.6%, especially when women enter menopause because of the decrease in the body's estrogen hormone. Objective: The purpose of this study was to analyze the relationship between central obesity and the incidence of high cholesterol in menopausal women in Indonesia. Methods: This was quantitative research used a cohort retrospektif design study with 686 total samples. Data analysis were done in univariate, bivariate and multivariate. Results: There were 20,8% menopausal woman who had high cholesterol. The results showed that central obesity had a relationship with the incidence of high cholesterol in menopausal women after being controlled by physical activity, fiber consumption, saturated fat intake and residence (RR = 2,62; 95% CI = 1,11-6,21). It can be concluded that central obesity is closely related to the incidence of high cholesterol in menopausal women in Indonesia, so the suggestion in this study is for people to adopt healthy lifestyles, exercise sufficient physical activity, exercise regularly, and eat foods that are high in fiber and low in saturated fatty acids.

Keywords: *high cholesterol, central obesity, menopausal*

1. INTRODUCTION

Non-communicable diseases (PTM) were the leading cause of death in the world in 2012, as many as 56 million deaths occurred and 38 million of them were caused by non-communicable diseases (noncommunicable disease), especially cardiovascular disease, cancer and chronic respiratory diseases. Cardiovascular disease is included in the category of non-communicable diseases caused by abnormalities in blood vessels. In general, this event is caused by atherosclerosis and hypertension. The occurrence of blockages in blood vessels can cause interference with the supply of nutrients and oxygen to organs in the body. This can cause ischemia in tissues that do not get blood supply [1].

High cholesterol can cause plaque buildup to occur in the walls of arteries or commonly called atherosclerosis. This can block some or all of the blood flow and cause coronary heart disease. Some of the factors that influence total cholesterol levels are high-fiber diets, high-fat diets, smoking habits, gender, obesity and physical activity [2]. According to the research of Akmal et al, obesity which is marked by an increase in BMI is proven to be at high risk for cardiovascular diseases, such as total cholesterol and LDL cholesterol, total fat and saturated fatty acids. The impact of suffering from obesity in a long time can cause metabolic disorders in the form of hypercholesterolemia [3].

According to Riskesdas 2013 the prevalence of high cholesterol (hypercholesterolemia) based on sex and place of residence was found in men by 30%, and in women which was higher by 39.6% [4]. Women are more at risk due to various things including, due to hormonal factors, pregnancy, and menopause. There is a tendency for an increase in total cholesterol with age [5]. Menopausal women have the highest total cholesterol levels compared to other age groups. The greatest average HDL value is found in the group of postmenopausal women (1.65 mmol / L), and compared with women in other age groups [6]. After menopause, morbidity and mortality from cardiovascular disease increase. The body's protection decreases due to reduced estrogen hormone production, the effects of aging, increased body weight, and body fat distribution seem to be the main problem. This results in high LDL and triglyceride production and low HDL levels. This is because it is influenced by hormonal factors, namely the declining function and production of the hormone estrogen [7].

The phenotypic metabolism of postmenopausal women can increase the tendency to accumulate body fat in the abdominal area which causes obesity. Changes in lifestyle that have developed in Indonesia make the incidence of obesity increase from year to year despite the fact that Indonesia is a developing country [2]. The prevalence of central obesity in Indonesia is 7.2% in men and 46.3% in women. A person with obesity has a high risk of

experiencing insulin retention and metabolic complications such as type 2 diabetes mellitus, hypertriglyceridemia, and decreased HDL (high density lipoprotein) cholesterol, hypertension and cardiovascular disease (Pusparini, 2007). The prevalence of central obesity in Indonesia is 7.2% in men and 46.3% in women [8].

2. METHOD

This research was conducted using secondary data from the Indonesia Family Life Survey (IFLS) in 2007 and 2014. The research method used was observational analytic cohort design with a retrospective study. Sampling technique on IFLS data is multistage random sampling. The sample in this study were women who had experienced menopause and did not suffer from high cholesterol at the time of enumeration in 2007, amounting to 686 respondents. Data analysis conducted in this study was univariate, bivariate with chi-square and multivariate tests using multiple logistic regression with risk factor models.

3. RESULTS AND DISCUSSION

Table 1. Respondent characteristics

Variable	Frequency (n)	Percentage (%)
High cholesterol		
Yes	143	20,8
No	543	79,2
Central Obesity		
Yes	434	63,2
No	252	36,8
Age		
≥ 52 years old	363	52,9
< 52 years old	323	47,1
Phisical activity		
Less	359	52,4
Enough	327	47,6
Fiber consumption		
Never	103	15,0
Rarely	162	23,6
Often	421	61,4
Saturated fat intake		
Often	381	55,5
Rarely	152	21,1
Never	153	22,4
Level of education		
Low	630	91,9
High	56	8,1
Income		
High	204	29,8
Low	482	70,2
Diabetes		
Yes	10	1,5
No	676	98,5
Residence		
Urban	235	34,2
Rural	451	65,8

Univariate analysis results that show that there are 20.8% of respondents who suffer from high cholesterol, and who suffer from central obesity by 63.2%. The majority of respondents are aged ≥ 52 years (52.9%), have less physical activity (52.4%), often consume fiber (61.4%), often get saturated fat intake (55.5%), have low education (91.9%)), low income (70.2%), do not suffer from diabetes (98.5%), and live in rural areas (65.8%) (Table 1).

The results of bivariate analysis showed that there was a relationship between central obesity, age, physical activity, never consuming fiber, rarely consuming fiber, often getting saturated fat intake, rarely getting saturated fat intake, education level and residence with high cholesterol incidence in menopausal women at Indonesia. Meanwhile, there is no significant relationship between income and diabetes with the incidence of high cholesterol in menopausal women in Indonesia (Table 2).

The results of multivariate analysis showed a relationship between central obesity and the incidence of high cholesterol in postmenopausal women after being controlled for physical activity, fiber consumption, saturated fat intake, education level and residence (p-value = 0.029; RR = 2.62; 95% CI = 1.11-6.21) (Table 3).

Table 2. Risk factors for high cholesterol in menopause

Variable	High cholesterol		*P- value*	RR%(95 CI)
	Yes	No		
Central obesity				
Yes	123	311	<0,001	3,59 (2,21-5,85)
No	20	232		
Age				
≥ 52 years old	88	274	0,032	1,44 (1,03-2,03)
< 52 years old	55	287		
Physical activity				
Less	102	257	< 0,001	2,26 (1,55-3,29)
Enough	41	286		
Fiber consumption				
Never	40	71	< 0,001	4,17 (2,30-7,57)
Rarely	55	107	< 0,001	3,87 (2,25-6,69)
Often	48	365	-	Refference
Saturated fat intake				
Often	106	275	< 0,001	7,71 (3,14-18,9)
Rarely	30	122	< 0,001	4,96 (1,89-12,9)
Never	7	146	-	Refference
Level of education				
Low	125	506	0,019	0,59 (0,39-0,90)
High	18	37		

Income				
High	46	158	0,561	1,11 (0,78-1,57)
Low	97	385		
Diabetes				
Yes	3	7	0,327	1,60 (0,66-3,87)
No	140	536		
Residence				
Urban	77	158	< 0,001	2,23 (1,54-3,21)
Rural	66	385		

Table 3. Multivariate analysis association of central obesity with high cholesterol occurrence in menopause women after controlling confounding variables

Variable	RR *Crude*			RR *Adjusted*		
	P-Value	**RR**	**95%CI**	***P-Value***	**RR**	**95%CI**
Central obesity	0,031	2,57	1,09-6,06	0,029	2,62	1,11-6,21
Age	0,202	1,36	0,85-2,19	-	-	-
Physical activity	<0,001	2,34	1,46-3,75	<0,001	2,43	1,53-3,86
Fiber consumption (never)	<0,001	7,37	3,94-13,8	<0,001	7,54	4,01-14,2
Fiber consumption (rarely)	0,001	2,76	1,53-4,97	<0,001	2,80	1,57-5,02
Saturated fat intake (often)	0,011	5,44	1,48-19,9	0,010	5,30	1,49-18,78
Saturated fat intake (rarely)	0,038	4,04	1,08-15,1	0,036	3,96	1,09-14,3
Level of education	0,527	0,78	0,36-1,68	-	-	-
Income	0,625	113,	0,69-1,82	-	-	-
Diabetes	0,629	1,54	0,26-9,05	-	-	-
Residence	0,030	1,94	1,07-3,52	0,019	1,98	1,12-3,50

Based on univariate analysis, it is known that almost a quarter of respondents suffer from high cholesterol, while more than three-fourths of the other respondents were declared not to suffer from high cholesterol. According to the 2013 Riskesdas data, the highest prevalence of people with high cholesterol was 39.6% for women while for men it was 30%. Long-term estrogen hormone deficiency is the most influential risk factor for the incidence of high cholesterol in menopausal women. The hormone estrogen serves to help control cholesterol levels and can also function as an antioxidant. LDL cholesterol can more easily penetrate plaque in the arterial blood vessels when it is oxidized. The role of estrogen as an antioxidant is to prevent the LDL oxidation process so that the ability of LDL to penetrate plaque will be reduced. When still menstruating, estrogen is produced properly in a woman's body so that cholesterol levels are not a problem because estrogen can regulate cholesterol levels and balance LDL and HDL levels. However, after not experiencing menstruation (menopause), the factors that balance LDL and HDL are reduced [9].

Central obesity is closely related to the incidence of high cholesterol in menopausal women, where central obesity is characterized by fat deposits in the visceral region is very closely related to the incidence of high cholesterol. Central obesity can cause interference with the regulation of fatty acids which will increase triglyceride and estrogen ester levels. An increase in blood cholesterol can also be caused by an increase in cholesterol found in very low-density lipoprotein and low-density secondary lipoprotein due to increased triglycerides large in the body's circulation when there is excessive fat accumulation in the body. The more accumulation of fat in the abdominal cavity will be followed by increased levels of total cholesterol and LDL cholesterol, known as hypercholesterolemia (high cholesterol) [10].

Based on multivariate analysis, it is known that central obesity is associated with the incidence of high cholesterol in menopausal women after being controlled by physical activity, fiber consumption, saturated fat intake and residence. The results of this study are in line with previous research.. Stating that there is a significant relationship between central obesity and the incidence of high cholesterol in women where women who suffer from central obesity are 1.72 times more likely to experience high cholesterol compared to women who are not obese central [11]. The state of central obesity is influenced by unbalanced fiber consumption, fat consumption and lack of physical activity so that more fat accumulation occurs in the abdomen because fat cells in the abdomen are larger, so that it can increase the tendency to accumulate body fat in the abdominal area which causes central obesity, especially when women enter menopause due to changes in the phenotypic metabolism of menopausal women. The impact of central obesity is very direct effect on the incidence of high cholesterol, this is related to the accumulation of fat in the abdominal cavity. This can cause blockages in blood vessels that cause interference with the supply of nutrients and oxygen to organs in the body. So it can be said that central obesity has a significant relationship to the incidence of high cholesterol, especially in menopausal women [10](Table 3).

Based on the results of bivariate analysis it is known that as many as more than a quarter of the incidence of high cholesterol in menopausal women the majority of respondents who did less physical activity compared to respondents who did enough physical activity (Table 2).

Likewise, the results of multivariate analysis stated that postmenopausal women who had less physical activity were 2.43 times more likely to suffer from high cholesterol compared to menopausal women who had sufficient physical activity. This shows that the frequency of carrying out one's physical activity affects the incidence of high cholesterol in menopausal women (Table 3).

The results of this study are also in line with research conducted by Mamat, there is a significant relationship between physical activity and the incidence of high cholesterol, where respondents who have less physical activity risk 1.2 times to suffer from high cholesterol compared with respondents who do enough physical activity

[7]. Sports and physical activity carried out regularly also has a beneficial effect on increasing insulin sensitivity and it will affect the metabolism of lipids and carbohydrates. Exercise and physical activity carried out regularly also has a beneficial effect on increasing insulin sensitivity and it will affect the metabolism of lipids and carbohydrates [5].

From the univariate analysis, more than a quarter of respondents suffer from high cholesterol in respondents who have never consumed fiber compared to respondents who often consume fiber. While rarely consume fiber in the last week as much as 34.0% compared with respondents who often consume fiber by 11.7%. Likewise, the results of multivariate analysis stated that menopausal women who had never consumed fiber had a risk of 7.54 times to suffer from high cholesterol compared to menopausal women who often consume fiber. Whereas postmenopausal women who rarely consume fiber risk 2.8 times to suffer from high cholesterol compared with menopausal women who often consume fiber. The results of this study are in line with research conducted by Mamat which states that there is a significant relationship between fiber consumption and the incidence of high cholesterol, where respondents who consume less fiber risk 1.25 times to suffer from high cholesterol compared with respondents who consume enough fiber [7]. Fiber has an important role in reducing blood cholesterol levels, this happens because the binding of cholesterol by fibers that occur in the stomach and intestines. This fiber forms gelatin and passes through digestion binds bile acids and cholesterol binds and then excreted through feces. By pulling cholesterol out of digestion, the cholesterol level that enters the blood decreases. Eating fiber regularly can reduce cholesterol levels by 15-19 percent [11].

Based on the results of bivariate analysis it is known that the majority of respondents who suffer from high cholesterol often get saturated fat intake compared to respondents who have never received saturated fat intake. While the incidence of high cholesterol in menopausal women in the category of rarely getting saturated fat intake in the last week was 19.8% compared to respondents who often consumed 4.7% fiber. Likewise, the results of multivariate analysis stated that menopausal women who often get saturated fat intake had a 5.3 times risk of suffering from high cholesterol compared to menopausal women who had never received saturated fat intake. While postmenopausal women who rarely get saturated fat intake have a risk of 3.96 times to suffer from high cholesterol compared with menopausal women who have never received saturated fat intake.

The results of this study are in line with research conducted by Lamb, which shows that there is a relationship between consumption of fat, saturated fat with cholesterol levels from food to total cholesterol levels. Samples that have high cholesterol levels mostly have a total intake of fat, saturated fat and food cholesterol exceeding recommendations [12]. Cholesterol is a result of increased fat intake both saturated fat and cholesterol and central obesity. The intake of saturated fats and sources of cholesterol from foods that are consumed in excess can affect lipid profile levels such as increased levels of triglycerides and cholesterol, even though the body's cholesterol production is only 25 percent sourced from the cholesterol of the food consumed [13].

Based on the results of bivariate analysis, it is known that the incidence of high cholesterol in menopausal women is the majority of respondents who live in urban areas compared to respondents who live in rural areas. Likewise, the results of multivariate analysis stated that postmenopausal women living in urban areas had a risk of 1.98 times to suffer from high cholesterol compared to menopausal women who lived in rural areas. The results of this study are in line with research conducted by Shuang Wang et al. Which states that there is a significant relationship between urban dwelling and high cholesterol events, where respondents who live in urban areas are 1.82 times more likely to suffer from high cholesterol than respondents who live in rural areas [14]. Unhealthy lifestyles in urban communities have been linked to many other important causes of death, as well as cardiovascular diseases and cancer. The rapid increase in the number of people with cholesterol is the impact caused by a combination of lifestyle and food consumption patterns of urban communities that can be said to be unhealthy. The unbalanced diet of urban people, that is high carbohydrate (especially sugar and fat) in urban communities, causes more nutritional problems, besides this unbalanced diet also increases the incidence of degenerative diseases, such as cholesterol, hypertension, diabetes, and heart [14].

Bivariate analysis results showed that almost a quarter of respondents aged berusia 52 years suffer from high cholesterol. However, the results of multivariate analysis statistical tests show that there is no relationship between age and the incidence of high cholesterol in menopausal women in Indonesia. The results of this study are in line with research conducted by Marjani et al, who stated that there was no significant relationship between age and total cholesterol levels in menopausal women. The knowledge a person has can come from prior knowledge, personal or other experiences and several other factors that can shape a person's knowledge over a long period of time and will last into old age. In theory, age affects the development of a person's mindset and mindset, the older a person is, the processes of mental development improve, but at a certain age, the increase in mental development process is not as fast as when he was a teenager. Increasing a person's age can affect the increase in knowledge he gets [15].

The results of the bivariate analysis showed that more than three quarters of respondents who suffer from high cholesterol have a low level of education. But the results of multivariate analysis statistical tests show that there is no relationship between the level of education with the incidence of high cholesterol in menopausal women. The results of this study are in line with research conducted by Shuang Wang et al, which states that there is no significant relationship between education level and total cholesterol levels and shows a weak correlation with positive patterns, which means that the older the higher the total cholesterol level. Someone with a low level of education does not mean absolutely low knowledge as well and someone with a high level of education does not mean absolute well knowledge either. The theory says that education is an activity or learning process to develop or improve certain abilities sothat the educational goals can stand alone. The level of

education also determines whether or not someone is easy to absorb and understand the knowledge they have acquired, in general the higher a person's education the better the knowledge [16].

Bivariate analysis results show that there is a relationship between income and the incidence of high cholesterol in menopausal women. But the results of multivariate analysis statistical tests show that there is no relationship between income and the incidence of high cholesterol in menopausal women. The results of this study are in line with research conducted by Shuang Wang et al., Which states that there is no significant relationship between age and total cholesterol levels and shows a weak correlation with positive patterns, which means that the older the higher the total cholesterol level. This can happen because not only people with high incomes can provide certain facilities to obtain knowledge and information about the symptoms of high cholesterol suffered by someone. Because knowledge of something can be obtained from anywhere. This study differs from the results of previous studies which stated that someone with a higher income level had better knowledge. In theory, a person's income level will also determine the availability of a facility needed for a particular activity, so this income level will affect one's knowledge [16].

The results of bivariate and multivariate analyzes of this study indicate that there is no relationship between diabetes and the incidence of high cholesterol in menopausal women. The results of this study are in line with research conducted by Shuang Wang et al., Which states that there is no significant relationship between diabetes or high blood sugar with total cholesterol levels, this is because diabetes has no direct effect on the incidence of high cholesterol. greater effect on the incidence of high cholesterol in menopausal women. And there are other factors that support the results of research that states that diabetes (high blood sugar) is not associated with high cholesterol is often to consume foods that are high in saturated fat and consume less foods that contain fiber, and less physical activity [16].

4. CONCLUSION

The results of multivariate analysis show that central obesity affects the incidence of high cholesterol in menopausal women after being controlled by physical activity, fiber consumption, saturated fat intake and residence with a RR value of 2.62 (95% CI; 1.11-6, 21).Advice that can be given based on this research was adjust the diet, Increase physical activity, for example, do exercises with mild movements with moderate intensity for 30 minutes as much as 5 times / week or gymnastics with heavy movements for 20 minutes as much as 3 times / week or can also do brisk walking as much as 2 times / week for each 30 minutes each and jogging 2 times / week for 20 minutes each. It is expected to provide counseling programs to increase understanding of risk factors and symptoms of high cholesterol especially for women who have and will enter menopause, as well as holding free cholesterol checking programs regularly.

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